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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/021,373	10/22/2001	Harald Berger	003015.098149	7250

29540 7590 10/31/2005

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EXAMINER	
MCNELIS, KATHLEEN A	
ART UNIT	**PAPER NUMBER**
1742	

DATE MAILED: 10/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/021,373	BERGER ET AL.	
	Examiner	Art Unit	
	Kathleen A. McNelis	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Acknowledgement of RCE

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.115, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 September 2005 has been entered.

Claims Status

Claims 1-15 were previously canceled. Claims 16-32 remain for examination wherein claims 16, 18, 19, 21, 24-29 and 31-32 are amended.

Status of Previous Rejections

The previous rejection of claims 16 to 32 under 35 U.S.C. 103(a) as being unpatentable over Eichberg et al in view of Dimitrov et al and Merriam Webster's Collegiate Dictionary is withdrawn in view of applicants' arguments and amendment to the claims.

The previous rejection of claims 16 to 32 under 35 U.S.C. 103(a) as being unpatentable over Berger et al in view of Lindholm is withdrawn in view of applicants' arguments and amendment to the claims.

DETAILED ACTION

Claim Rejections - 35 USC § 112

Claim 31 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. No method for "foaming water vapor" is disclosed in the specification, nor would it be obvious to one skilled in the art. If this is intended to read "forming water vapor", additional information is required regarding the cooling process.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 16-25, 28, 29, 31 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eichberger et al. (U.S. Pat. No. 6,524,362) in view of Berger et al. (U.S. Pat. No. 5,573,573).

Eichberger et al. discloses a method for melting metal-containing material in an electric arc furnace. In the furnace interior space, iron is melted under a foamy slag layer. Metal containing material (DRI) is fed by gravity through at least one lance into the foamy slag layer (abstract and Figure 1). The metal feeding lance is positioned and the position controlled during melting so that "...the lance aperture is always kept inside the foamy slag layer, so that no DRI is entrained to the roof of the furnace by ascending gases" (col. 2, lines 1-13). Eichberger et al. teaches injection of gases to the slag layer and melt (col. 2, lines 14-32), which will also mix the slag metal melt.

Eichberger et al. does not teach that the electrodes are directly obliquely against the central region of the furnace as in instant claim 16.

Berger et al. discloses a method for producing steel in an electric arc furnace (abstract) in which the electrodes are oriented obliquely downward towards the center of the vessel (col. 3 lines 8-12 and Figure 1(a)). The intention of this arrangement is direct the arcs towards a central feedstock, melting a cavity in the pile of charging stock (col. 2, lines 19-26). Berger et al. teaches that this arrangement of the electrodes enables an

efficient superheating of the melt as well as refining, deoxidizing and alloying while providing optimum protection to the graphite electrodes (col. 3 lines 5-18). It would have been obvious to one of ordinary skill in the art at the time the invention was made to orient the electrodes obliquely as taught by Berger et al. in the furnace of Eichberger et al., to allow for efficient superheating, refining, deoxidizing and alloying of the melt while providing optimum protection to the graphite electrodes as taught by Berger et al.

With respect to claim 17, energy is provided in the method of Eichberger et al. in view of Berger et al. by electric arc, directed towards a central feedstock as described above. With respect to claim 18, either fine particulate or lumpy iron may be fed into the furnace of Eichberger et al. in view of Berger et al. (Eichberger et al. col. 1, lines 30-42).

With respect to claims 19 and 20, the method of Eichberger et al. in view of Berger et al. accepts hot feed (DRI from reduction plant) at temperatures of 300 to 1000 °C (Eichberger et al., col. 3, lines 25-28). The range of 300 to 1000 °C overlaps the range of between 500 to 1000 °C in instant claim 19. It would have been obvious to one of ordinary skill in the art at the time the invention was made to feed hot DRI into the furnace of Eichberger et al. in view of Berger et al. at a temperature of between 500 to 1000 °C, because Eichberger et al. in view of Berger et al. teaches that any temperature between 300 to 1000 °C is suitable.

The range of 300 to 1000 °C overlaps the range of between 600 to 700 °C in instant claim 20. It would have been obvious to one of ordinary skill in the art at the time the invention was made to feed hot DRI into the furnace of Eichberger et al. in view

of Berger et al. at a temperature of between 600 to 700 °C, because Eichberger et al. in view of Berger et al. teaches that any temperature between 300 to 1000 °C is suitable.

The slag layer in the method of Eichberger et al. in view of Berger et al. is foamed (Eichberger et al. col. 2 lines 14-21) as in instant claim 21. Gaseous oxygen is applied to the slag layer to form the foamed slag (Eichberger et al. col. 2 lines 14-21) as in instant claim 22. Fine grained carbon is added to the slag in the presence of oxygen to foam the slag (Eichberger et al. col. 2 lines 14-21) as in instant claim 23.

The metal material is introduced to the furnace of Eichberger et al. in view of Berger et al. solely by gravity (Eichberger et al. col. 1 lines 35-40) as in instant claim 24. The feed tube is positioned to keep the aperture always within the foamy slag layer (Eichberger et al. col. 2, lines 5-15), which is a function of the feed rate since this is a factor in determining the height of the melt inside the furnace, as in instant claim 25. With respect to claim 28, natural gas is fed to the furnace, forming a mixture of CO and H_2 that rises into the furnace, and an oxygen-fuel gas mixture is fed for afterburning (col. 10, lines 56-65).

The method taught by Eichberger et al. in view of Berger et al. is continuous (Eichberger et al. col. 1, lines 59-65, and Berger et al. col. 3 lines 40-18) as in instant claim 29. The furnace of Eichberger et al. in view of Berger et al. is cooled by a water-cooled shells (Berger et al., col., 5, lines 1-5 and col. 8, lines 62-67) and the electrodes are cooled by organic substances introduced through the electrode cavities (Berger et al., col. 10, lines 35-46) as in instant claim 31.

With respect to claim 32, Eichberger et al. in view of Berger et al. discloses a method for melting metal under slag in the interior space of a furnace, wherein the metal is fed exclusively by gravity into a central region of the melt, through at least one charging tube opening into a foamy slag layer, the position of which is controlled during the melt, and the electrodes are operated at an oblique angle against the central region of the furnace as described above.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eichberger et al. (U.S. Pat. No. 6,524,362) in view of Berger et al. (U.S. Pat. No. 5,573,573) and further in view of Roth (U.S. Pat. No. 5,641,336).

Eichberger et al. in view of Berger et al. teaches a continuous steelmaking process as discussed above.

Eichberger et al. in view of Berger et al. does not teach continuously maintaining the slag layer in the furnace.

Roth discloses a process for draining overflow foam slag from a furnace (abstract and Fig. 1 below). Roth teaches that is especially important to control a foamed slag layer in electrical furnaces to prevent the slag from reaching and damaging furnace sealing components on the walls. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a slag overflow as taught by Roth to the furnace of Eichberger et al. in view of Berger et al., to prevent the slag from reaching and damaging sealing components on the furnace walls as taught by Roth.

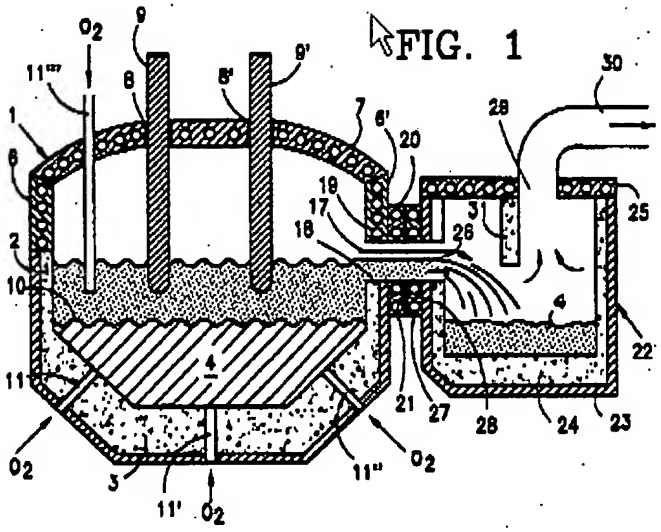

FIG. 1

Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eichberger et al. (U.S. Pat. No. 6,524,362) in view of Berger et al. (U.S. Pat. No. 5,573,573) and further in view of Usher et al. (U.S. Pat. No. 5,827,474).

Eichberger et al. in view of Berger et al. teaches a method of introducing feed into a foaming slag layer by use of a feeding tube as described above.

Eichberger et al. in view of Berger et al. does not teach using an electrically conductive feed tube, providing a voltage measurement device and positioning the charging tube in the slag as a function of voltage measured by the voltage measurement device.

Usher et al. discloses the use of a voltmeter and electrically conductive probe for measuring the depth of molten steel and slag in an electric furnace, wherein the probe may be formed as a tube (abstract). Usher et al. teaches that this device can accurately measure the depth of the layer of slag (col. 2, lines 23-27). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use

an electrically conductive tube and voltage meter as taught by Usher et al. in the process of Eichberger et al. in view of Berger et al., since the method of Eichberger et al. in view of Berger et al. requires placement of feed into a slag layer (Eichberger et al. col. 2, lines 1-14) and Usher et al. teaches that this method accurately measures the depth of slag (Usher et al., col. 2, lines 23-27) as in claim 26.

With respect to claim 27, the process of Eichberger et al. in view of Berger et al. and in further view of Usher et al. includes impedance monitoring to determine the integrity of the voltage readings should the connection between probe and voltage meter be broken during operation (col. 4, lines 1-19). Since impedance is a measure of the resistance to current flow, this is an indirect method of providing a current measurement device for use in positioning the charging tube.

Response to Arguments

Applicant's arguments with respect to claims 16-32 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kathleen A. McNelis whose telephone number is 571-272-3554. The examiner can normally be reached on M-F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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